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# ★ Food ★ For ★ Freedom

CURRENT SERIAL RECORD

U. S. DEPARTMENT OF AGRICULTURE

## BY BETTER RANGE-CONSERVATION PRACTICES

IN THE  
PACIFIC NORTHWEST



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**U.S. DEPARTMENT OF AGRICULTURE**

**P**RODUCTION of livestock on our western ranges is one of the most vital necessities of war. To keep up this production to meet the increasing demands of a long war will require the most skillful handling of our already crowded range lands.

Even the most ordinary range-livestock enterprise is a highly diversified operation. The successful operator must have better than average judgment in the handling of his livestock, his grazing land, his winter feed production, and in evaluating his marketing possibilities. In order to apply range-conservation practices effectively, the rancher must know clearly what they are, their purpose, their limitations, and their advantages. He should also consider such factors as cost, the time required before the practices become effective, and whether he alone, or as one of a group, will be most effective in applying them.

All of these practices have been studied and tested, some of them for many years. Stockmen have been in the forefront of this effort. Their experience and the experimental work of the Forest Service, Bureau of Plant Industry, Bureau of Animal Industry, Soil Conservation Service, and other Federal agencies and the State experiment stations have developed the practices and shown their effects on the range, the forage plants, and the livestock. Under practical range conditions, the use of these practices is helping to increase the figures on the weight slips at the war-crowded stockyards.

# Food for Freedom by Better Range-Conservation Practices in the Pacific Northwest

By W. T. WHITE, *Chief, Range Division*, W. R. FRANDSEN, *range examiner*, R. R. HUMPHREY, *associate range examiner*, and N. T. NELSON, *assistant range examiner, Pacific Region, Soil Conservation Service*

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## INTRODUCTION

**R**ANGE CONSERVATION is sound, practicable, and profitable. The adoption of range-conservation practices on a ranch assures that the soils of that ranch will be kept in a high state of productivity, and that there will be sustained production of the best forage the land is capable of growing. Never was this more important than it is today, when maximum marketing of meat animals is vital in what may be a long war, as well as in the post-war period when our ranges may be called upon to help supply the meat demands of a large part of a half-starved world.

The advantages of carefully planned range practices are not always appreciated. The long-established custom of putting large numbers of livestock on the range early in the season and leaving them there for as long as possible is still considered good management by some operators. Such a wasteful policy patently has no place in today's wartime conservation economy. Fortunately, however, the majority of stockmen believe that profitable management requires more thoughtful planning in order to realize the best forage yield on the grazing lands they own, rent, or use under permit. To assure the full forage production necessary to meet wartime needs, the practices that lead to range and forage improvement must be adopted. Under present conditions, such practices are essential if the operator is to maintain a profitable ranch business.

On the pages that follow, the more important range-conservation practices which will preserve the soil and maintain or improve the forage on Pacific Northwest grazing areas are described. Advantages of the individual practices and considerations that will assist the stockmen in applying them effectively are listed.

## TIME-TESTED RANGE-CONSERVATION PRACTICES

### PROPER STOCKING

Proper stocking is the use of grazing land with the number of live-stock and at the time of year which will leave sufficient vegetation to protect or improve the forage and soil. Adjustments in the time and rate of stocking necessary to graze the range properly will depend on the kind, amount, and condition of the forage and on its effectiveness in controlling erosion under the different physical conditions of soil and topography.



Careful adjustment of numbers of livestock to forage-growth requirements has made it possible for the operator to maintain this bunchgrass range at a high level of production.

### ADVANTAGES OF PROPER STOCKING

1. Forage will show more thrift and start growth earlier in the season.
2. The desirable plants will increase in volume and density and more forage will be produced, permitting increased livestock production in future years.
3. The residue of dead and decaying plants left ungrazed will improve soil conditions, permit better absorption and retention of moisture, and provide more effective control of soil erosion.
4. Plants of low palatability will decrease in abundance, and losses from poisonous plants will be reduced.
5. Larger calf crops as well as heavier calves at weaning, should be produced from fewer breeding animals.
6. Better quality wool, larger lamb crops, and heavier lambs should be produced—all with greater economic returns per acre and for the ranch.



## POINTS TO CONSIDER FOR EFFECTIVE APPLICATION OF PROPER STOCKING

1. The grazing load (numbers of livestock) should be adjusted before the beginning of the grazing year.

2. Midseason inspections of the range should be made to determine whether plant growth is adequate for the remainder of the season.

3. Livestock should be removed promptly when the important forage species have been grazed to the proper stubble height. Supplemental pasture or aftermath may be used to carry such animals until they are ready to go to the feed lot or market.

4. A reserve of range forage should be left ungrazed each year for such emergencies as drought, fire, or other unforeseen circumstances.

5. Very young lambs or calves do not, as a rule, greatly increase the grazing load, but as they approach weaning age they may graze and trample large amounts of forage and seriously overload the range unless a forage allowance is made for them. Large numbers of lambs or calves well-advanced in age, should not be allowed to use range that is fully stocked by mature animals unless supplemental feeding is given or the grazing area is increased.

6. Travel and trailing of livestock on the range or pasture should be reduced to a minimum consistent with the movement of animals required in grazing and securing daily water and salt.

## ROTATION GRAZING

Rotation grazing is the use of different fields, pastures, or parts of a range in orderly sequence. The areas used during a given period in any year may be alternated in such a way that no unit is grazed during the same period in consecutive years.



Portion of a 33,000-acre sheep ranch in eastern Washington grazed under a rotation system. The plan of ranch operation is expected to increase materially the forage yield and the safe production of livestock on this range.

## ADVANTAGES OF ROTATION GRAZING

1. Provides livestock with the maximum amount of fresh-growing forage.
2. Helps to harmonize grazing use with plant-growth requirements and permits harvesting of the forage crop with less injury to the plants.
3. Provides rest and recovery periods for units on which emergencies may have necessitated temporary overgrazing.
4. Helps to control animal diseases.
5. Increases the total forage produced as compared with ranges grazed continuously.
6. Provides good pasture for use of stock immediately before marketing.

## POINTS TO CONSIDER FOR EFFECTIVE APPLICATION OF ROTATION GRAZING

1. The successful operation of a system of rotation grazing depends on the effectiveness of the control of livestock in their movements between pastures during the grazing season.
2. Large range areas should be subdivided where practical into subunits of nearly equal grazing capacity of sufficient number to fit the type of livestock operation and to permit use in harmony with plant needs.
3. Fences provide the most effective means of control but are not always required. On ranges where fence construction is not immediately practicable, or where the forage values are too low to justify heavy expenditures for fencing, it is possible to practice a reasonably satisfactory grazing rotation by closing the watering places on the range to be protected, salting livestock in areas to be used, and distributing the livestock by riding.
4. Plans for fencing for the purpose of practicing rotation grazing should be coordinated with other plans for handling livestock on the range, such as division of the range into steer and heifer pastures, establishment of seasonal ranges for the herd in general, and related details of ranch management.
5. Rotation grazing should be practiced in combination with deferred grazing whenever feasible.
6. Longer regrowth periods should be allowed on deteriorated ranges than on ranges in good condition.
7. Some ranges are more suitable for use during one season than another, and should be used regularly year after year during the same period. For example, rougher areas that afford protection to livestock during inclement weather may comprise the only range suitable for winter use. The season of use for such areas should be considered in planning the system of grazing to be followed.
8. When dividing a range for rotation grazing, the possibility of providing an adequate supply of stock water in each pasture at the time water is needed should be taken into account. If sufficient water is apt to be lacking at the time the pasture is to be used, and cannot be developed economically, the purposes of rotation grazing are likely to be defeated.
9. Certain types of forage are more palatable at certain seasons and should be used when most highly relished by livestock. A



forage inventory provides information on the relative amount and kind of forage available on different pastures to be used in rotation.

### DEFERRED GRAZING

Deferred grazing is the postponement of the use of the forage until it has attained a certain stage of growth, usually seed maturity of the important forage plants. Planned deferment is important in maintaining ranges in good condition, or improving ranges having a poor stand of perennial grasses.



Deferred spring use on this overgrazed ponderosa pine-bunchgrass cattle range produced very satisfactory recovery of vigor and density of the overstory grasses. Continued deferment with summer or fall use will restore the finer understory grasses in the majority of cases.

### ADVANTAGES OF DEFERRED GRAZING

1. Permits production, ripening, scattering, and planting of seed to maintain or increase the important forage plants.
2. Permits forage, if lightly or moderately grazed after seed maturity, to make maximum growth in early spring the following year.
3. Permits desirable forage plants to develop fully and to compete more successfully with the less desirable grasses and weeds for plant food and moisture.
4. Builds up a reserve forage supply for late seasonal use and in times of drought.
5. Improves the range without the loss of the forage crop in any year.
6. Aids in the control of livestock parasites.

## POINTS TO CONSIDER FOR EFFECTIVE APPLICATION OF DEFERRED GRAZING

1. Ranges with a reduced stand of desirable forage plants low in vigor should be given first priority in selecting areas to defer.

2. In selecting areas for deferment a high priority should also be given to areas reserved for critical periods in livestock production, such as calving or weaning pastures, or pastures for use just prior to marketing.

3. Each part of a range in fair or good condition should be deferred at least once in 3 or 4 years. Severely deteriorated ranges should be deferred 2 years in succession to permit establishment of grass seedlings.

4. Since bunchgrasses of the Pacific Northwest usually reproduce only by seeds, the opening and closing dates for the deferred period depend upon the dates these important plants start spring growth and later reach seed maturity.

5. Short periods of heavy grazing on weeds and cheatgrass brome followed by a nonuse period, if properly planned, may reduce the vigor and density of undesirable plants and increase both the density and volume of desirable grasses.

6. The size of the herd should be adjusted to the deferred grazing plan, so that pastures not being deferred will not be overstocked.

7. After a grazing unit has been deferred, it should not be overloaded with livestock for extended periods. Stocking rates should always be adjusted to secure proper grazing use of the available forage.

## SUPPLEMENTAL FEED RESERVES

Supplemental feed reserve is feed, other than range forage, held or stored for emergency use or for use later in the year, in addition to supplements required for a balanced diet for fattening or maintenance. These supplemental feed reserves may be either hay or concentrates held for feeding livestock on the range when forage is insufficient or of inferior quality. The importance of providing for and maintaining supplemental feed reserves has increased with the decrease in the quality and quantity of available native forage.

## ADVANTAGES OF MAINTAINING AN ADEQUATE FEED RESERVE

1. Reduces excessive use of range forage in unfavorable years and prevents damage to the range resulting from such use.

2. Permits increased calf and lamb crops and improved quality of marketed products, resulting in increased income to the rancher.

3. Prevents stunting of young stock and costly shrinkages of animals on short rations.

4. Helps to maintain a balanced, stable livestock operation.

5. Permits maximum utilization of range forage by eliminating the need for excess range-forage reserve.

6. Helps to minimize income losses due to high prices of feed and excessive operating costs in times of drought.



An ample supply of hay on this ranch is good insurance against shortage of forage on the range.

#### POINTS TO CONSIDER FOR EFFECTIVE USE OF A SUPPLEMENTAL FEED RESERVE

1. Hold in reserve each year an adequate amount of easily stored feeds (hay and grain) to meet such emergencies as drought, fire, crop failure, and inclement weather.
2. Foresee and thus prepare for periods of low feed supplies. Even the best bred livestock will not produce at a maximum unless properly fed.
3. Know the nutrient values of the different feeds and determine the proportionate amounts of cheap, home-grown feeds that will insure safe carry-over in case of drought or unforeseen feed shortage.
4. Use efficient feeding methods, such as feeding from racks designed to reduce wastage. Good quality feeds should be used and careful consideration given to balanced ration requirements of the different classes of livestock.

#### RANGE RESEEDING

Range reseeding is the establishment of vegetation on areas suitable for forage production by drilling in the seed, or by broadcasting seed and covering it by such mechanical methods as brush dragging, harrowing, or trampling in the seed by livestock.



The seeding of crested wheatgrass on this depleted range has hastened recovery and materially increased the amount of forage available for livestock.

#### ADVANTAGES OF RANGE RESEEDING

1. Will increase forage production and may often be used to provide more forage or better forage during specific periods on areas characterized by seasonal forage shortages.
2. On the more favorable sites a more desirable perennial forage cover can be established in from 2 to 4 years and may be used to relieve adjacent overgrazed areas of their excessive grazing load.
3. Reseeded areas serve as seed sources for new plantings or for natural seed dissemination to adjacent depleted range.
4. Soil depletion through erosion may often be checked before the soil loses its productiveness.
5. The reestablished plant cover will reduce runoff and increase soil-moisture penetration, thus increasing spring flow and stabilizing stream flow.

#### POINTS TO CONSIDER FOR EFFECTIVE APPLICATION OF RANGE RESEEDING

1. Areas with good soil and moisture conditions should be reseeded where the desirable forage has been depleted by excessive grazing, fire, or previous cultivation and the resulting erosion is likely to prevent the reestablishment of an effective cover. Reseeding is seldom profitable where natural recovery of the native forage can be expected



within a reasonable length of time under good range-management practices.

2. The soil and moisture conditions should be such that reseeding has a reasonable chance of success. The growth requirements of each species should be known, and such species selected as are suited to the site.

3. Before planting, the operator should have reliable information on the proper time of seeding, seedbed preparation, seed mixtures, quality of seed, and rate, depth, and methods of seeding.

4. Areas where the soils have been packed by trailing or trampling should be seeded only after preliminary treatment to break the packed surface.

5. Where unusually hot fires have killed all or most of the vegetation, seeding should be done as soon as possible following the fire in order to take advantage of temporarily available nutrients and reduced weed seed, and to control erosion of valuable topsoil

### WATER DEVELOPMENT

Properly spaced, adequate, and dependable water supplies are essential both for the welfare of the livestock and for the conservation of the range. Water supplies should be located so as to facilitate distribution of livestock, relieve overuse of range areas, reduce travel and trailing, and to aid in securing proper seasonal use of ranges.



EXTENSION SERVICE—S 1914. C

Water supply on cattle range. Such small reservoirs, constructed by the ranchers themselves, add greatly to the value of poorly watered ranges.



## ADVANTAGES OF PROPERLY SPACED AND CONSTRUCTED WATER DEVELOPMENTS

1. They are a major factor in obtaining proper distribution of livestock for the full and safe utilization of native or cultivated forage.

2. They aid in applying deferred and rotation systems of grazing and facilitate proper seasonal use of range units.

3. They reduce trailing and overuse of the range and thus prevent erosion and stimulate increased forage production.

4. They provide livestock with an adequate amount of clean, accessible water and permit more rapid gains through reducing travel to water.

## POINTS TO CONSIDER FOR EFFECTIVE USE OF WATER DEVELOPMENTS

1. Grazing animals should be kept on fresh feed as much as possible and undue concentration of livestock around a few watering places should be avoided in order to secure a more uniform utilization of forage. Cattle should not be required to travel more than half a mile to water on steep, rough, timbered, or brushy ranges, nor more than 2 miles on flat or gently sloping areas. Sheep should ordinarily not be required to travel more than 1 mile to water in mountainous, brushy, timbered, or rocky country, nor more than 3 miles on flat or gently sloping, open land.

2. The amount of water required daily will vary with the kind and class of livestock, kind of feed, and weather. As a general guide 10 to 12 gallons of water for cattle and horses, and 1½ gallons for sheep may be considered safe estimates for average daily water requirements.

3. In planning water developments, the repair or improvement of all existing natural water supplies should be given first consideration.

4. Springs are usually the cheapest source of stock water that can be developed, and require little maintenance. Wells, reservoirs, or pipe lines from distant sources may be desirable to supplement the cheaper developments.

5. Where the cost of supplying permanent water is prohibitive, inexpensive, temporary water should be developed; or, if this is not feasible, needed supplies can be hauled by tank wagon.

## FENCING

Boundary, division, and drift fences are usually necessary in the control of livestock on the range and in facilitating uniform distribution, especially on cattle ranches.

## ADVANTAGES OF PROPER FENCING ON RANGE UNITS

1. Division fences are important in securing proper management on range areas through facilitating the even distribution of livestock and correct seasonal use, and in the application of special systems of grazing necessary for the improvement of range conditions.

2. Drift fences, sometimes in connection with natural barriers on the more extensive ranges, prevent stock from drifting from their regularly assigned range and also facilitate proper seasonal use of the range.

3. Fencing prevents losses from poisonous plants by controlling or preventing use of areas where such plants are prevalent during the time they are dangerous.

4. It facilitates erosion control and revegetation by keeping livestock off severely eroded and gullied areas.

5. It aids in obtaining increased calf and lamb crops by providing better control of breeding herds.



This 10,000-acre range was fenced into five 2,000-acre pastures to enable the owner to eliminate herding expenses and to control the grazing on his range lands.

#### POINTS TO CONSIDER FOR EFFECTIVE MANAGEMENT OF RANGE LANDS THROUGH FENCING

1. The amount of livestock drift from adjoining lands should be carefully considered in deciding whether or not to fence the exterior boundaries of grazing units or ranches. Boundary fences may not be necessary on sheep ranches where such topographic features as streams and ridgetops provide natural barriers and boundaries for practical grazing units.

2. The advantages of using fenced paddocks or pastures for more efficient management of sheep should be investigated. Such pastures, where the animals graze without herding, are already being used successfully by some ranchers in the Northwest and may become more important in the future as a means of improved management.

3. Within practical limitations, subdivision of ranges into seasonal units should be planned so as to form pastures having similar grazing capacities rather than equal acreages.

4. The number of fenced or pasture range units on any particular ranch should be based on:

a. The necessity of separating range land from other ranch lands in order to obtain proper seasonal use of native forage on one hand and cultivated feed and forage crops on the other.

b. The need for separating different classes of livestock (heifers, cows, bulls) that cannot satisfactorily be grazed in common during all seasons.

c. The proportion of the year livestock are not on the ranch, but are grazing on national forests, other Federal ranges, or leased pastures.

d. The number of fenced areas required for a satisfactory system of rotational or deferred grazing.

e. The number of livestock grazed. A costly system of pastures for a relatively few head is uneconomical.

### SALTING

Salting is the planned distribution on the range of the amount of salt required by the livestock during the period the unit of range is being grazed.



Salt distribution in small quantities away from water helps to keep stock from bunching up in large groups and destroying the range.

### ADVANTAGES OF CORRECT SALTING PRACTICES

1. Salting in accordance with the seasonal development of the forage assists materially in improving the range through retarding drift of livestock to higher ranges before the forage is ready.

2. Properly located salt grounds promote an even distribution of livestock and consequently more uniform harvest of the forage.

3. Good salting practices assist in securing greater use of less accessible forage, and minimizing damage from livestock concentrations around water and in critical erosion areas.

4. Salt provides livestock with an essential element in their ration, thus promoting greater and more rapid gains, keeping the animals more contented, and making them more easily handled.

#### POINTS TO CONSIDER FOR EFFECTIVE SALTING

1. A salting plan should provide for the needs of the number of livestock that will graze in each range unit. The amount of salt should be adjusted not only to the number of livestock but also to the amount of forage that can be properly utilized. A specified amount of salt should be placed at each point designated in the plan.

2. Salt for cattle and horses should be placed so as to draw the animals away from points where they naturally bunch up, and into range where underutilized forage is available, to accessible slopes, ridges, knolls, and benches that are usually undergrazed, and to openings in browse types. In general, salt should be located from one-half to one mile from water, but never closer than one-fourth mile in easily accessible country, or one-eighth mile in rough topography.

3. Sheep should be salted at or near their bed grounds but away from water, meadows, overgrazed areas, eroded sites, and heavy infestations of poisonous plants.

4. The amount of salt required will be affected by the salt content of the feed, succulence of the feed, amount of salt in the water, and the presence of natural salt licks. Cattle as a rule need about 2 pounds of salt a month while on succulent feed or browse, and 1 pound per month when the feed is drier. Breeding sheep may consume nearly one-half ounce per head daily and fattening lambs from one-fifth to one-fourth ounce.

5. Salt should be placed at each location in a sufficient number of places to prevent undue trampling and grazing of the area by livestock "waiting their turn." The stockman's preference should govern the kind of salt used. The salt containers should not be watertight, as accumulated rain water will dissolve the salt. Blocks may be broken, or two or more may be put out so that a number of animals can use them at once.

6. Surplus salt remaining at the close of the grazing season should be removed to prevent wastage and to discourage the concentration of game animals.

#### NOXIOUS-PLANT CONTROL

The control of undesirable range plants, including those poisonous or mechanically injurious to livestock, will materially improve the range in many instances. Such plants decrease in vigor and density and are replaced by palatable species as the range improves. Sound grazing practices will reduce the likelihood of invasion of the range by noxious plants, will control light infestation, and reduce the danger of injury to livestock. Heavy infestations may require special control measures.





Cactus infestations as heavy as the one illustrated above as yet are rare on Pacific Northwest ranges. They can be prevented if a good grass cover is maintained on the range and other good management practices followed.

#### ADVANTAGES OF NOXIOUS-PLANT CONTROL

1. Results in increased forage production by eliminating the competition from undesirable plants
2. Reduces the hazard to livestock from poisonous plants and those which are mechanically injurious.
3. Facilitates proper seasonal use and uniform livestock distribution.
4. May reduce the labor cost in handling livestock.
5. May improve the condition, and hence the market value, of the livestock.

#### POINTS TO CONSIDER FOR EFFECTIVE CONTROL OF NOXIOUS PLANTS

1. Proper management is generally the cheapest and most effective method of noxious-plant control. Such plants are usually less abundant when the range is properly grazed and are rarely taken in harmful amounts when adequate palatable forage is available.
2. The practice of proper stocking or deferred grazing will increase the more palatable plants and enable them better to compete with the noxious species. If the density and vigor of palatable species are kept near the maximum, there is little likelihood that the unpalatable or poisonous plants will invade the range.
3. Losses from poisonous plants in lightly infested areas can usually be prevented by removing salt from such areas during the season when the plants are likely to be injurious, and drawing livestock into poison-free areas.



4. Ranges heavily infested with poisonous plants may be grazed by the kind of livestock immune to injury. Larkspur areas, for example, may be grazed with impunity by sheep whereas cattle would suffer heavy losses.

5. On treated areas, good range management will enable the desirable forage plants to fill in the places left bare by the control treatment, and will reduce or prevent the recurrence of the undesirable plants.

### CONTOUR FURROWING

Contour furrowing is the construction of small, shallow, level furrows for the purpose of checking runoff and permitting water to penetrate the soil.

#### ADVANTAGES OF CONTOUR FURROWS

1. Contour furrows insure maximum retention of rainfall in dry seasons when the forage is likely to be short and conditions favor runoff.

2. They aid in developing greater forage production on suitable sites.

3. They hasten the recovery of seriously depleted ranges, when used in conjunction with reseeding operations.



Contour furrowing, accompanied with rotation grazing, was responsible for the increased forage to the right of the fence on this cow range. To the left of the fence the forage has been used too heavily and under such conditions, furrowing usually is of little value.

4. They effectively increase soil-moisture infiltration, arrest soil erosion, and aid in flood control.

5. The additional soil moisture enables the forage to stay green over a longer period, especially in seasons of light rainfall.

#### POINTS TO CONSIDER FOR EFFECTIVE APPLICATION OF CONTOUR FURROWS

1. Contour furrows should be constructed only when management and grazing control alone cannot produce a satisfactory cover of vegetation.

2. The practice should be applied where the soils are deep and have a high water-storage capacity.

3. It is useless to attempt range restoration by contour furrowing if injurious range practices are permitted. Range and livestock management should allow the development of a vegetative ground cover adequate to control erosion and regulate runoff after the furrows have silted full.

4. Depleted areas treated by contour furrows should be protected from grazing use for a sufficient period to permit vegetation to become established.

5. Medium-sized furrows from 6 to 12 inches in width will produce the best results.

6. Contour furrows are not usually effective on areas having shallow, light-textured or highly permeable soils.

7. The cost of furrowing should not exceed the value of the benefits which it is expected will accrue from the increased forage.

#### WATER SPREADING

Water spreading is the diversion of runoff water from gullies or watercourses and its distribution on adjacent gently sloping lands. The volume of water flowing down the channels is reduced and the moisture absorbed by the spreading area increases the growth of vegetation.

#### ADVANTAGES OF WATER SPREADING

1. Increases soil moisture on normally moisture-deficient, low-producing areas, thus greatly increasing forage production.

2. Prevents gully head-cutting and facilitates stabilization of gullies and drainages by vegetation.

3. Permits the retention and spread of fertile topsoils washed from higher lands.

4. In many instances, reduces downstream damage from flash floods of short duration.

#### POINTS TO CONSIDER FOR EFFECTIVE APPLICATION OF WATER SPREADING

1. Since water-spreading structures are relatively costly, the rancher should be reasonably certain before construction is started that the expected benefits from the increased forage, and from any reduction in flood-water damage, will balance or exceed the costs.



Water spreading on flat or gently sloping lands has increased the forage production on many western ranches.

2. Because of the greater loss in case of failure of large structures, costly installations should be avoided unless engineering assistance in designing the water-spreading system is available.

3. Relatively low gradient valleys having deep, highly productive soils offer the best opportunities for safe water spreading at a low cost.

4. Where watercourses are long, several diversions from the main channel will utilize the water most effectively.

5. The excess water should be controlled by suitable drops or diversion ditches so as to avoid causing erosion on the areas where the water is spread, or drowning of the vegetation.

6. Spreading devices are not advisable on steep and rocky upper drainage areas but should be used on the flatter flood plains where the water will readily be absorbed for later use by the forage plants.

7. Small dams and diversions are effective in many places. Diversions around the heads of small gullies are simple structures and useful in controlling head cutting if the water is not diverted to steep slopes or to areas with little vegetative cover and highly erodible soil.

#### FIRE PROTECTION

Range fires cause severe damage to valuable forage and soil, and protective measures are necessary in order to prevent their start and restrict their spread.



FOREST SERVICE—253689

Range fires not only deprive grazing animals of forage during the current season, but also reduce range yields in future years. (Courtesy of the U. S. Forest Service.)

#### ADVANTAGES OF EFFECTIVE FIRE CONTROL

1. Prevents loss of the current year's forage crop.
2. Assists in maintenance of desirable perennial forage plants.
3. Assists in the maintenance of soil productivity by preventing permanent loss of the organic topsoil layer.
4. Aids in preventing the invasion of noxious weeds and annual grasses.

#### POINTS TO CONSIDER FOR EFFECTIVE FIRE PROTECTION

1. Adequate fire breaks should be constructed along highways and well-traveled roads. Breaks should be approximately 10 feet in width and should be kept free from inflammable material throughout the fire season.
2. To be effective as a fire barrier, the bare soil should be exposed by plowing or scraping.
3. In wind-erosion areas, the breaks should be constructed at right angles to the prevailing winds to keep the bare soil from blowing.
4. Growth of the relatively less inflammable kinds of forage should be encouraged.
5. A green growth of succulent plants makes a safe firebreak. Border strips of perennial grasses that will remain green during the fire season should be planted along roads and lanes in areas of highly inflammable vegetation.

6. Fire precautions should be observed, especially during periods of high fire hazard.

7. Fire caution signs should be posted at strategic locations to keep the public warned of the fire hazard during the fire season.

8. Arrangements should be made to have sufficient equipment suitable for fire fighting on hand at strategic points for immediate use when needed.

9. The kind, amount, and location of available fire-fighting equipment should be listed and the information made available to ranch operators and users in the vicinity.

10. Groups of ranchers should organize and equip voluntary fire-fighting crews who can get to fires quickly before widespread damage is done.

11. Means should be established for quickly obtaining additional fire-fighting personnel and equipment in case of continued emergency.



